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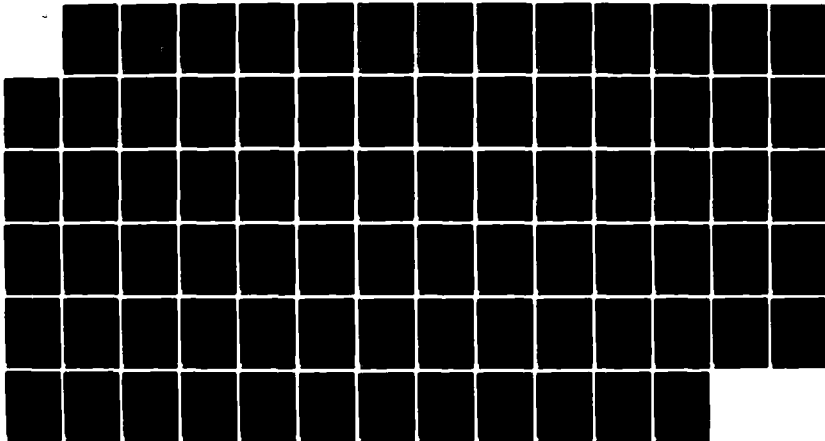
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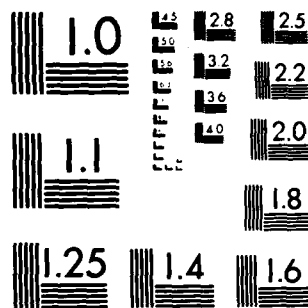
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EVALUATION OF THE TRIPAD SYSTEM AT
KEESLER MEDICAL CENTER

Arthur D. Little, Inc.
Acorn Park
Cambridge, Massachusetts 02140

February 10, 1984

Final Report for Period 2/16/82 - 2/10/84

Prepared for
TRIMIS PROGRAM OFFICE
5401 Westbard Avenue
Bethesda, Maryland 20816

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EXECUTIVE SUMMARY

In the spring of 1983 a Tri-Service Medical Information Systems (TRIMIS) automated patient administration (TRIPAD) system became fully operational at the USAF Medical Center at Keesler Air Force Base (Keesler) in Biloxi, Mississippi. The TRIPAD system supports the patient registration, admission, disposition, and transfer functions at the MTF. It also prepares patient bills and automatically generates several reports which were previously produced manually.

This report presents an evaluation of the TRIPAD system at Keesler AFB. The evaluation focuses on the system objectives which were established as part of the system development process. The results are based on data collected before and after the system was installed at the site. Baseline data were collected in two work centers (Inpatient Admissions and Clinical Records) in February through March 1980, and in a third work center (Business Office) in October through November 1981. Post-implementation data were collected in September 1983. The data collected were used to estimate savings in time or cost of completing various activities and the savings were then compared to those stated in the system objectives.

Table E-1 presents the objectives identified and the results of the evaluation. Of the 28 original objectives, six were not included in the evaluation (mostly due to unavailable data). Of the remaining 22, thirteen were clearly met at the time of the post-implementation study.

Of the nine objectives not achieved, two were not met because system design did not address the problem. For two others, the assessment is based on personnel interviews because quantifiable data were not available, and in both cases the issues are not considered significant problems at the site.

The remaining five objectives were not met because of an increase in time needed to register and admit patients. This increase is partly due to additional registration/admission activities imposed by the system. The new activities involve entering patient registration

Table E-1

SUMMARY OF SYSTEM OBJECTIVES AND SYSTEM PERFORMANCE
AT THE TIME OF POST-IMPLEMENTATION STUDY

Objectives	Achieved	Not Yet Achieved
<u>A. Personnel Productivity</u>		
1. Reduce time per unit of workload in:		
a. R/ADT		o
b. Clinical Records	o	
c. Business Office	o	
2. Reduce personnel time for admission and disposition functions:		
a. Collecting patient registration information.		o
b. Number of times patient registration data are collected.	o	
c. Time devoted to producing Medical Treatment Recording Card (MTRC).	o	
3. Personnel time to complete routine activities by availability of patient registration/admission data.	o	
4. Eliminate time devoted to the Patient Strength Report.	o	
5. Eliminate time to maintain the patient information file.	o	
6. Eliminate individual ward Bed Occupancy Lists.		o
7. Reduced nursing staff time devoted to clerical activities.		o
<u>B. Training Time (Reduce Time)</u>	o	

Table E-1

SUMMARY OF SYSTEM OBJECTIVES AND SYSTEM PERFORMANCE
AT THE TIME OF POST-IMPLEMENTATION STUDY
(Continued)

Objectives	Achieved	Not Yet Achieved
<u>C. Patient Time</u>		
1. Reduce average length of stay attributable to patient administration	o	
2. Reduce average patient waiting time	o	
3. Reduce average patient time for		
a) admission	o	
b) discharge	o	
4. Reduce time for admission and disposition of active duty personnel	o	
D. <u>Patient Service</u> (Reduced Number of Unidentifiable Laboratory, Radiology, Etc.)	o	

Table E-1

SUMMARY OF SYSTEM OBJECTIVES AND SYSTEM PERFORMANCE
AT THE TIME OF THE POST-IMPLEMENTATION STUDY
(Continued)

Objectives	Achieved	Not Yet Achieved
<u>E. Financial Benefits</u>		
1. Increase collection of monies for pay services.	0	
2. Decrease personnel costs.	0	
<u>F. Patient Satisfaction (Decrease Patient Complaints)</u>		0
<u>G. Increase staff satisfaction (Increase Satisfaction)</u>	0	

and admission information into the system data base. It is also due, however, to an increase in time needed to locate patient beds. This increase is unrelated to TRIPAD.

The net benefits of the TRIPAD system are summarized in Table E-2. These data show that the total personnel time saved by the system is equivalent to the workload of nearly five people. These savings are achieved in the Clinical Records Office (where TRIPAD saves time in coding and correcting Clinical Record Cover Sheets) and throughout the hospital (where the reports generated by the system provide information to support activities in at least 13 work centers ranging from Patient Affairs to the Nursing Wards). In addition to these quantifiable benefits, the automated system may help to assure staff job satisfaction and staff resource allocation which may improve patient care at the facility.

Table E-2

DOCUMENTED BENEFITS OF THE TRIPAD SYSTEM

Office	Benefit	Value	Annual Benefit (hr/yr)
R/ADT	patient admissions	-2.9 min/admission	-534
	maintaining information file	0.8 min/admission	147
Clinical	Coding Clinical Record Cover Sheet	2 FTE	4160
Business Office	Maintaining Accounts Receivable	24.5 min/day	106
	Capturing registration data	0.8 min/admission	147
All	information availability	23.8 hr/day	6188
		TOTAL	10214

Nonquantifiable Benefits:

- o MTF staff satisfaction
- o Improved patient care

I. INTRODUCTION

In the spring of 1983 the last module of a Tri-Service Medical Information Systems (TRIMIS) automated patient administration (TRIPAD) system became operational at the USAF Medical Center at Keesler Air Force Base (Keesler) in Biloxi, Mississippi. The TRIPAD system supports the patient registration, admission, disposition, and transfer functions at the MTF. It also prepares patient bills and automatically generates several reports which were previously produced manually. Three system modules were installed sequentially at Keesler over a two-year period between spring 1981 and spring 1983.

The three modules of the TRIPAD system correspond to the three hospital offices that it supports. these are:

- Registration/Admission, Disposition, Transfer (R/ADT) (installed April 1981);
- Clinical Records (CR) (installed March 1982);
- Business Office (BO) (installed April 1983).

The R/ADT module stores patient registration/admission data, records patient location and duration of stay, and generates several regular reports on the activities of the Patient Affairs Office. The Clinical Records module prints a coded summary of each inpatient treatment for archive storage and generates a monthly report for the Air Force Medical Administration Management System (MAMS) summarizing information on all patients treated at the facility. The Business Office module generates patient bills, maintains the accounts receivable records, and summarizes the financial activities of the office on a monthly basis.

The role of the TRIPAD system has evolved since its conception. Originally, it was implemented as a stand-alone system serving only the above offices. TRIPAD is presently considered to be the foundation of the next generation TRIMIS systems which will include several Initial Operational Capability (IOC) systems linked to the TRIPAD data base. TRIPAD will consolidate the on-line patient registration data bases, and provide eligibility verification capability to the

interfaced IOC systems (because of an interface with the Defense Eligibility Enrollment Records System, DEERS). This report presents an evaluation of TRIPAD as a stand-alone system within the context of the original system objectives. The costs and benefits of the TRIMIS Interim Standard System where TRIPAD will be interfaced with other TRIMIS systems have also been studied and are the subject of two other reports. (1,2)

The DoD evaluation protocol specifies a comparison of data collected before and after automated systems are installed. This is a means of measuring the effectiveness of each system in meeting its objectives. The baseline (pre-implementation) data were collected mainly by Analytical Services, Inc. (ANSER). Arthur D. Little, Inc., collected supplemental baseline data for Business Office functions. The results of these studies were published in November 1980³ and December 1981,⁴ respectively. Implementation monitoring has also been conducted and is the subject of three Arthur D. Little reports.^{5,6,7} The final data collection effort (post-implementation) was conducted September 26-29, 1983, and this report presents an evaluation of the TRIPAD system within the context of the system objectives.

This report is organized in four main sections (including this Introduction). Section II presents the Methodology used to collect data and evaluate the system. The results of these activities are presented in Section III and conclusions based on the results are summarized in Section IV.

II. METHODOLOGY

The overall approach to the TRIPAD evaluation at Keesler focused on the objectives that were proposed for the system at its conception. Evaluation criteria were developed from a review of documented system objectives^{8,9} and these criteria identified the data needs for the evaluation. The review was conducted by Arthur D. Little and TPO staff at the time the post-implementation study was planned. A subsequent review of the baseline data (which was collected in February through April 1980) identified a number of criteria for which no baseline data existed (negating any use for quantifiable post-implementation data). As a result of this background investigation, a few of the original criteria were omitted due to unrecoverable data gaps, and means were devised to address each of the remaining criteria. The results of this effort are presented in Appendix A and the original criteria are summarized in Table 1.

Four general techniques were used for post-implementation data collection. For sixteen of the criteria, personnel were interviewed to collect information on TRIPAD operations and changes from baseline operations, because baseline data were not adequate to measure changes. Most of the interviews were with office supervisors and resulted in subjective estimates of time saved by automating several of the routine office functions.

Work sampling was used in the R/ADT and Business Offices. This procedure involves recording at regular intervals the activities of each office staff member. These data can be used to determine the amount of staff time spent in each activity and the cost (in personnel time) per unit of workload. Examples of the forms used for data collection in these offices are presented in Appendix B.

Timed observation is a more direct way of measuring personnel time per unit of workload. This technique involves direct measurement of the time required to complete discrete activities; it was used primarily for measuring patient time in the admission and disposition processes.

Table 1

SUMMARY OF TRIPAD EVALUATION CRITERIA

A. Personnel Productivity

1. Reduce time per unit of workload in R/ADT, CR, BO.
2. Reduce personnel time for specific admission and disposition functions:
 - a. collecting patient registration information;
 - b. retrieval of previous registration data;
 - c. number of times patient registration data are collected; and
 - d. time devoted to producing Medical Treatment Recording Card (MTRC).
3. Reduce personnel time to complete routine activities by availability of patient registration/admission data.
4. Eliminate time devoted to the Patient Strength Report.
5. Eliminate time to maintain the patient information file.
6. Eliminate individual ward Bed Occupancy Lists.
7. Reduce nursing staff time devoted to clerical activities.

B. Training Time (Reduce Time to Train Staff)

C. Patient Time

1. Reduce portion of average length of stay attributable to patient administration.
2. Reduce average patient waiting time.
3. Reduce average patient time for admission, discharge or change of status.
4. Reduce time for admission and disposition of active duty personnel.

Table 1

SUMMARY OF TRIPAD EVALUATION CRITERIA
(continued)

D. Patient Service

1. Reduce number of unidentifiable result reports (laboratory, radiology, etc.).
2. Reduce number of outpatients seen without a complete medical record.
3. Increase system security and data privacy.

E. Financial Benefits

1. Increase collection of monies for pay services.
2. Eliminate preprinted registration forms.
3. Decrease personnel costs.
4. Decrease non-personnel costs.
5. Decrease total operating cost.

F. Patient Satisfaction (Decrease Patient Complaints)

G. Staff satisfaction (Increase Satisfaction)

The fourth data collection technique was a survey completed by the staff of the R/ADT, Business, and Clinical Records offices. The intent of the survey was to gauge the degree to which staff are satisfied with the system and to assess any change in the level of satisfaction which may be attributable to TRIPAD. The questionnaire used is also presented in Appendix B.

The data collected were used to evaluate the system against the criteria identified. Interviews and records reviews were structured to provide the needed information. Timed observations of selected activities were averaged to determine a mean time for each activity. Work sampling data were used in conjunction with the work sampling interval and workload information to estimate mean personnel time for each activity. These were then compared to equivalent data from the baseline collection activities at Keesler (and in a few cases to baseline data collected at Fairchild AFB) to determine the net change for each criterion.

There were several unique factors related to the TRIPAD system which posed special constraints on the system evaluation. Keesler was a developmental site for the PAD system, and system installation was therefore phased over a two-year period. This created a longer than typical time lag between the baseline and post-implementation studies. During this time lag subtle operational and organizational changes unrelated to TRIPAD undoubtedly occurred at the site. These changes could not all be identified nor accounted for in the evaluation of TRIPAD. Also, the system itself underwent some transition in functionality as it was developed and implemented. The system and evaluation objectives evolved as the system changed, so the baseline evaluation plan and data could not all be used directly in performing the final system evaluation. A third factor affecting the study was that the system contractor changed after the baseline study was conducted. This change was accompanied by a shift in evaluation philosophy and approach.

The PAD evaluation also has the limitation that it was conducted in a single site. This was a consequence of the fact that PAD is a developmental system. However, generalizations based on a single site

are more subject to possible error than those based on findings confirmed at two or three sites.

All these constraints should be kept in mind when evaluating the result of this evaluation of the PAD system.

III. RESULTS

Data were collected for 22 of the criteria identified in Section II. The data collected are presented in Appendix C. The results of the data collection are summarized in Table 2 which lists, for each criterion, the expected change, the observed (measured) change, and the percent change with respect to each criterion. Details of calculations are presented in Appendix D.

Six of the criteria previously identified were omitted from the study either because data needed for the evaluation were not available or because the criteria were not applicable to the TRIPAD system at Keesler. Previous patient registration data were not retrieved under manual operations at Keesler, and as a result the criterion which referred to the elimination of this retrieval was omitted. TRIPAD was redefined to delete an outpatient records function, therefore a criterion which was based on a complete outpatient record was omitted. System security and data privacy are goals of the system, but this criterion was omitted because there is no way to document unauthorized access. The automated system was expected to eliminate registration forms, but no such forms were used at Keesler and this criterion was omitted. Finally, baseline data for non-personnel costs were not available, and as a result criteria based on reductions in non-personnel costs and total operating costs were omitted.

A. PERSONNEL PRODUCTIVITY

Productivity is measured by the amount of personnel time required to complete the major function of each office. Overall personnel productivity has increased in two of the three offices affected by the TRIPAD system.

1. Time Per Unit of Workload

a. Clinical Records Office

The major function of the Clinical Records Office is reviewing each inpatient's chart and summarizing the diagnoses and treatments provided on a clinical record cover sheet which is then entered in the patient's permanent medical record. The Clinical Records Office

Table 2

SUMMARY OF EVALUATION RESULTS

	Anticipated Change	Observed Measured	Change Percent
A. Personnel Productivity			
1. Time per unit of workload			
a. Clinical Records	reduction	2 FTE	40%
b. Business Office	reduction	24.5 min/day	34%
c. Registration/Admission Disposition Transfer	reduction	(2.9 min/admission) (increase)	(29%)
2. Time for specific admission and disposition functions			
a. Enter patient registration data	reduction	(2.8 min/admission) (increase)	(68%)
b. Manual retrieval of previous registra- tion data	elimination	-----omitted-----	
c. Redundant capture-patient registration data	elimination	0.8 min/admission	100%
d. Produce MTRC	reduction	3.0 min/admission	91%
3. Time savings resulting from information availability (Ad Hoc reports)	reduction	23.8 hr/day	*
4. Time to produce Patient Strength Report	reduction	1 hr/day	100%
5. Time to maintain Patient Information File	reduction	0.8 min/admission	41%
6. Eliminate individual ward Bed Occupancy Lists	elimination	unaffected	0
7. Nursing staff time devoted to clerical activities	reduction	unaffected	0
B. Time to Train New Personnel			
1. Supervisor time	reduction	*	50%-88%
2. Time to become proficient	reduction	*	0%-50%

Table 2 (Continued)

SUMMARY OF EVALUATION RESULTS

	Anticipated Change	Observed Measured	Change Percent
C. Patient Time			
1. Portion of length of stay due to administrative requirements	reduction	(2.5 min/patient) (increase)	(11%)
2. Patient waiting time	reduction	(4.1 min/patient) (increase)	(55%)
3. Patient time for:			
a. Registration/Admission	reduction	2.5 min/patient	25%
b. Discharge	reduction	0.5 min/patient	13%
4. Active duty patient time for registration, admission, discharge	reduction	same as C-3	above
D. Patient Service			
1. Number of unidentifiable result reports	reduction	unaffected	0%
2. Patients seen without complete Medical Records	reduction	-----omitted-----	
3. System security and data privacy	increase	-----omitted-----	
E. Financial Benefits			
1. Collection of monies for pay services	increase	*	0%-41%
2. Elimination of registration forms	elimination	-----omitted-----	
3. Personnel costs	reduction	*	11%
4. Nonpersonnel costs	reduction	-----omitted-----	
5. Total operating cost	reduction	-----omitted-----	
F. Patient Satisfaction	increase	unaffected	*
G. Staff Satisfaction	increase	average rating 3.42 of 4.0 overall	

* Quantifiable data are not available.

supervisor reported that two of five full-time employees (FTE) previously needed for coding Clinical Record Cover Sheets have been assigned to other duties. This implies a 40% increase in office productivity.

b. Business Office

Duties in the Business Office which are affected by TRIPAD include routine patient billing activities and reconciling the Accounts Receivable with the funds collected daily. The office supervisor identified the latter as the major office activity. Work sampling data indicate the time required to reconcile accounts receivable has been reduced from 72.0 min/day to 47.5 min/day. This indicates a 34% increase in productivity in this activity.

c. R/ADT Office

The major function of the R/ADT Office is admitting and discharging patients. Of these two activities, admitting patients (which includes collecting registration information) is the more time consuming function.

The activities and personnel time required for patient registration and admission activities are presented in Table 3. These results are based on work sampling activities in the R/ADT Office. The total time required to register and admit patients, however, has increased by 29% (2.9 min/patient). This is, in part, due to the new task of entering patient registration/admission data into the TRIPAD system (1.4 min/patient). In addition, more staff time (additional 0.5 min/patient) was needed to find beds for patients during the post-implementation data collection period. The time to locate beds, however, is primarily a result of the level of facility use and is not greatly affected by the TRIPAD system.

2. Time for Admission and Disposition Functions

In addition to an overall increase in productivity in the offices affected, the objectives for the TRIPAD system identified several specific functions for which time savings were expected. The success with which the Keesler system met those objectives varied considerably, and the results are discussed below.

Table 3

COMPARISON OF PERSONNEL TIME TO COMPLETE REGISTRATION/ADMISSION
FUNCTIONS

Function	Time min/patient	
	Baseline	Post-Implementation
1. Complete AF560 and assign register number	4.2	3.0
2. Enter registration data.	-	0.9
3. Enter admission data.	-	3.0
4. Determine bed availability.	0.5	1.0
5. Update Bed Status Worksheet.	0.7	0.9
6. Prepare addressograph plate (MTRC).	2.8	0.3
7. Imprint forms and wristbands.	1.6	0.3
8. Assemble patient chart.	<u>0.2</u>	<u>3.5</u>
TOTAL	10.0	12.9

a. Collecting Patient Registration Information

Under manual operations, the activity of collecting patient registration information involved only completing the form AF560 (Request and Authorization for Admission). The automated system has added new activities to this process; entering patient registration and admission data into the TRIPAD data base. As a result, the time needed to enter patient registration data (including admission data) and to complete the AF560 has increased 64% (2.7 min) rather than decreased as expected.

b. Collecting Patient Registration Data More than One Time

One of the advantages of the TRIPAD system is that patient registration and admission data, once entered in the data base, are available to all systems which interface with the PAD data base; eliminating the need to capture that data more than once. This was one of the original objectives for the system and it has been fully achieved. A stop at the Business Office previously made by inprocessing patient has been eliminated because registration data previously collected at that stop is now available through the system. This results in a savings of about 0.8 minutes of Business Office personnel time per admission. Similar savings can be expected if other automated systems are interfaced with the TRIPAD data base in the future.

c. Producing the Medical Treatment Recording Card (MTRC)

The MTRC is an addressograph card (like a credit card) which is imprinted with patient identification information. The card is used to quickly imprint a variety of forms such as laboratory and radiology requests, pharmacy orders, etc.

The MTRC was previously produced manually at a machine which punched one letter at a time. Automating MTRC production was another objective of the TRIPAD system which was achieved. The procedure which previously consumed 2.8 minutes of personnel time per admission has been automated and now uses only 0.3 minutes. This is a 89% savings in clerk time.

3. Personnel Time to Complete Routine Activities

The TRIPAD system at Keesler produces 41 reports on a regular (daily, weekly, or monthly) basis. Thirteen of these reports were

previously produced manually and are now produced automatically. Most of the remaining reports are "ad hoc reports" which have been designed by MTF staff to meet specific information needs throughout the facility.

Another objective of TRIPAD is to save personnel time throughout the MTF by making patient registration and admission data available for a variety of uses. These reports are the mechanism through which these data are made available. The recipients of each system-generated report were interviewed to gather estimates of the amount of time saved by this information.

Table 4 lists the personnel time saved by each of the System products and known users as of 1 October 1983. This table indicates that the total time saved is 23.8 hr/day or nearly 3 full time employees (FTE). These savings are realized in one of two ways depending on the origin of the report:

- The time savings accrued in the A&D and Business Offices result from automating the production of previously required reports. These figures are based on baseline data collected in those offices and post-implementation interviews with office personnel.
- Time savings listed for other work centers are estimates of time saved when completing routine activities. These estimates were provided by the report users during post-implementation interviews.

In three cases, the users felt the reports they received resulted in no personnel time savings. The Infection Control Nurse recently ordered three reports but noted that the information reported was inconsistent with other data sources and, therefore, she will not use the reports until the problem is alleviated. She further noted that if she could trust the data, she would not save any time but would significantly improve patient care.

The Nursing Services Office reported no time saved by any of the system products. This statement conflicts with an estimate by the former Assistant Head of Nursing who estimated that she saved 2 days per month in making staff assignments by using one of the ad hoc

Table 4

TRIPAD SYSTEM PRODUCTS AND UNITS AFFECTED
(hr/day saved)

Products	Units Affected	Admissions and Dispositions	Business Office	Chaplain's Office	Department of Surgery	Hospital Services	Infection Control	Nursing Services	Orthopedics	Patient Affairs	Pharmacy	Resource Management	Unit Manager's Office	Ward JB
Admissions and Dispositions Listing	3.74		1											
Active Accounts Receivable	0													
Alpha Roster														
Bed Utilization Study (Department of Surgery)			2.15		3	0.12								
Cash and Sales Journal			0.06											
Cash Collection Detail			0											
Cash Receipt Distribution Report				1.0										
Current Inpatient Roster			0											
Current Inpatient Charges														
Daily Bed Report for Surgery					3.5	0.12								
Daily Ward Summary	0													
Discharge Planning Report														
Inpatient Service Listing					2.0									
Medical Reimbursements by Sales Code			0											
Medical Services Activities (MSA) Report			0.76					0						
Monthly Disposition Matrix			0											
Notification Report														
Nursing 24-Hour Patient Report	0.45								0.95					
Orthopedics Provider Report										1.75				
Patient Affairs Admission Report														
Patient Category Report	0													
Patient Report for Ward JB														
Pharmacy Inpatient Transaction Roster	1										0			1.65
Preadmission List														
Register of Patients	0.16			1.0										
Retired Patients Visitation Roster														
Roster of Delinquent Records														
Roster of SI/VSF Patients by Ward														
Same Day Disposition Roster	0.16													
Statement of Charges for Hospitalization - End of Month	0		0.13											
Statement of Charges for Hospitalization - Final			0.56											
Transmittal of Account for Collection			0.25											
UCA Monthly Disposition Report												0.57		
UCA Ward Report					0.32	0.12	0					0.57		
Unreported Central Dollar Sales			0											
Voucher for Transfers Between Appropriations and/or Funds			0											
Voucher Number Log			0.30											
Weekly Inpatient Summary - Army														
Weekly Inpatient Summary - Navy/MC														
Total (hr/day)	5.51	5.21	2.0	2.82	0.16	0	0	0	0.95	2.17	0	1.14	2	1.65

reports. In addition, she noted that the improved allocation of personnel resulted in improved patient care and improved staff morale. In spite of these comments, the more recent estimate of no savings was used for this analysis.

One other Work Center, the Pharmacy, reported no savings in pharmacy personnel time as a result of a report which provides the Pharmacy with registration data for individuals newly registered in the TRIPAD data base. The information, when received, is manually loaded into the Pharmacy data base. In this instance, however, the office supervisor noted that the report results in a savings of patient time which justified the document.

4. Personnel Time to Produce the Patient Strength Report

The Patient Strength Report is a daily report listing numbers of patients by personnel type, including active duty officers, enlisted personnel, retired personnel, dependents, and others. Numbers are listed by patient type including inpatients, quarters, leave, AWOL, etc. This is one of the reports regularly generated by the R/ADT Office and was specifically identified as an area where time savings were expected. The R/ADT supervisor reported that this report is fully automated, resulting in a savings of approximately one hour per day.

5. Time to Maintain the Patient Information File

The Patient Information file is a 3x5 card file containing registration and admission information on each current inpatient and quarters patient. It is used by R/ADT personnel to access frequently needed patient information such as room numbers, home address, etc. Baseline data indicate that 1.9 minutes per admission were spent maintaining this file while post-implementation data show this figure to be 1.1 min/adm. This implies the time spent in maintaining this file has decreased 0.8 min/admission (41%).

6. Time to Produce Bed Occupancy Lists

Bed occupancy lists identify patients on each ward by room number. These lists contain notes on diagnosis and treatments and are compiled by the nursing staff at the end of each eight-hour nursing shift. One of the expected impacts of the TRIPAD system was that the

bed occupancy lists produced by the individual wards would be replaced by a system-generated, consolidated ward Bed Occupancy Report. Interviews with nursing staff personnel indicated that this was not the case. Lists are still generated on the wards. Staff members noted that lists generated on the wards are more current than information in the TRIPAD system. As a result, they believe that the existing procedures result in less confusion than would be encountered by an automated procedure. They also noted that the situation may change if the wards had access to the TRIPAD data base via terminals on the wards. If this were the case, the ward personnel could ensure that the data base was current.

7. Nursing Time Devoted to Clerical Activities

Another expected benefit of the TRIPAD system was a general reduction in the time that nursing staff spent in clerical activities. The mechanism for this reduction is not described in the documentation which identifies this benefit and interviews with nursing staff supervisors indicate that the TRIPAD system has not affected the clerical activities required of the nursing staff.

B. TRAINING TIME

Another expected benefit of the TRIPAD system was reduced time needed to train new personnel. Since no formal training activities exist for the offices affected by TRIPAD, this benefit could be manifested in two ways: the supervisor time needed to train new personnel and the average length of time before a new employee became proficient at his or her job. Supervisors of each office were interviewed and asked to estimate these data. Their responses are summarized in Table 5.

These results indicate a belief on the part of supervisors that the system may not decrease the time needed for a new employee to reach proficiency, but the system can identify mistakes as they are made, thereby reducing the amount of direct supervision required during the training period by a range of 50% to 88%.

Table 5

TRAINING TIME FOR NEW PERSONNEL

	<u>Supervisor Time</u>		<u>Time to Reach Proficiency</u>	
	<u>Before</u>	<u>After</u>	<u>Before</u>	<u>After</u>
R/ADT	12-24 hrs	6-12 hrs	4 weeks	2 weeks
CR	528 hrs	66 hrs	6 months	6 months
BO	8 hrs	4 hrs	6 months	6 months

C. PATIENT TIME

In addition to saving hospital staff time, the TRIPAD system was expected to reduce the time patients spend attending to Patient Administration activities. In addition to improving patient satisfaction, a reduction in active duty patient time, if significant, could result in more time spent by active duty personnel at their regular jobs. Although patient time needed for some of the activities was reduced, the data presented in Table 6 indicate that overall patient time for administrative activities increased.

1. Length of Stay Attributable to Patient Administration

One of the benefits expected from the TRIPAD system was an overall reduction in the portion of the average length of stay attributable to the patient administration process. This process was taken to include the R/ADT and Business Office visits occurring at both admission and disposition. The data indicate that the patient time spent in R/ADT and the Business Office due to patient administration activities increased 2.7 min or about 11%.

Table 6

AVERAGE PATIENT TIME FOR PATIENT ADMINISTRATION ACTIVITIES

	System	
	Manual (min)	Automated (min)
Waiting to begin admission process	7.53	11.67
Registration/Admission	10.11	7.59
Business Office Inprocessing	0.28	0
Disposition	3.60	3.15
Business Office Clearance	<u>1.70</u>	<u>3.48</u>
TOTAL	23.22	25.89

2. Patient Waiting Time

When patients first arrive at the R/ADT office, they must usually wait while patients who arrived earlier complete their admission procedures. Reducing this waiting time was specifically identified as an objective for the TRIPAD system. However, the data presented above indicate that waiting time in the admission process has increased about 4.1 minutes (55%). According to facility staff, this increase is due mostly to the shortage of beds at the facility and the time spent locating a bed for each new inpatient. The increase is also partially related to procedural changes which will be discussed below.

3. Patient Time for Admission and Discharge

The data presented in Table 6 above reveal that the patient time required for the actual registration and admission process has decreased 2.5 min (25%). This finding is somewhat surprising in view of the increased personnel time noted earlier for the same activities; however, it is not contradictory. Admission procedures have been modified to allow some of the preliminary work to be done while the

patient is waiting, whereas under the old procedures all of this work was done with the patient at the admissions window. This change also contributed to the increased waiting time noted above.

Business Office inprocessing was never a time-consuming activity. It has now been completely eliminated, saving about 17 sec per patient.

The available data indicate disposition time may have been reduced slightly. However, because no baseline data exist for Keesler. The baseline figure of 3.6 minutes from a small sample at Fairchild AFB was used for the comparison. The Fairchild data are only estimates of baseline operations at Keesler.

The time required to clear the Business Office upon discharge is nearly doubled, increasing 1.6 minutes. This is surprising in light of the degree of automation in the Business Office. A possible explanation is that the baseline time does not include any patient waiting time whereas the time under the automated system does. The documentation for the baseline data does not include any assessment of this and, therefore, the baseline figure has been taken as including waiting time and service time.

4. Time to Admit and Discharge Active Duty Patients

Another objective specified for the TRIPAD system was a reduction in the time needed to admit and discharge active duty patients. The reason for this goal is that time spent by active duty personnel away from their assigned duties is a cost to the government.

Baseline data, however, did not differentiate between active duty and non-active duty patients. Because of this it could not be concluded that the baseline time needed to admit and discharge active duty patients differed from the time needed for other patients. Also, no procedural differences for active versus non-active duty patients were observed during the post-implementation data collection activity. Therefore, the times listed in Table 6 are assumed to apply equally to both categories of patients, indicating that this criterion was not met.

D. PATIENT SERVICES

The one criterion related to patient service is the number of result reports for laboratory or radiology work which cannot be returned to the requestor because of incomplete patient identification. No baseline data existed on this issue and so personnel in both areas were asked to compare these problems before and after TRIPAD was installed. In all cases, those interviewed felt that improper identification has not been a problem for inpatient work and the automated system has had no noticeable affect. The primary reason for this is that the MTRC, which is used for imprinting all inpatient work orders, was in use at the facility before the system was installed. Virtually the same card is presently used (automatically produced but the same product) and from the perspective of the Laboratory and Radiology Departments, no observable change has occurred.

E. FINANCIAL BENEFITS

Two financial benefits were studied as system objectives. These include increased collection of monies for pay services and a decrease in personnel costs. Both benefits are discussed below.

1. Collection of Monies for Pay Services

Another expected benefit is an improvement in the collection of monies for pay services. This results from the automated billing and follow-up procedures built into the Business Office function. The measure of this improvement was taken to be the rate at which delinquent accounts are written off at the Base Accounting and Finance Office (BAFO). These accounts are taken off the books by transferring them to the Air Force Accounting and Finance Center (AFAFC) at Lowrey AFB, Colorado. Table 7 presents the funds which were transferred to AFAFC based on records provided by the BAFO. Transfers are listed for the Fiscal Year in which the debt occurred.

These data show that over a 19-month period, ending April 30, 1983, a total of \$14,441,442 in delinquent funds were transferred to AFAFC. This results in an average monthly transfer of \$760,076. In the first five months of the automated system operation, \$3,311,041 were transferred averaging \$662,208 per month or an apparent 13% reduction.

Table 7

DELINQUENT ACCOUNTS TRANSFERRED TO AF ACCOUNTING AND
FINANCE CENTER, LOWREY AFB

Month	FY82	FY83	Total
Prior to October 1982	\$6,338,095	\$	\$6,338,095
October 1982	4,556,982		4,556,982
November	0		0
December	738,480		738,480
January	352,790		352,790
February	1,387,860	897,275	2,285,135
March	15,750	0	15,750
April	19,570	134,640	154,210
TOTAL			14,441,442
May	0	0	0
June	0	0	0
July	0	300,906	300,906
August	0	1,978,000	1,978,000
September	253,820	778,315	1,032,135
TOTAL			3,311,041

This result is difficult to interpret for a number of reasons. At the time these records were collected, none were available prior to October 1982. Assuming the pattern of transfers is the same from year to year, a great deal of delinquent FY1981 funds (possibly as much as \$7,000,000) may have been transferred during FY82, but these funds are not reflected in the "prior to October 1982" figure. If this were the case, the 19-month total would be about \$21,400,000, averaging \$1.1 million per month. This would indicate that a 41% decrease has been achieved.

On the other hand, the post-implementation period is less than one year, and therefore, does not reflect any seasonal variation which may occur. Data are insufficient to pinpoint the cause for the reduction in transfers occurring in March through July. If this is a seasonal lull, and the rate of transfers increases significantly in the fall and winter months, the 13% reduction noted above could be reduced or completely eliminated. Given the available data, however, the 13% reduction is taken as the benefit of the TRIPAD system.

2. Personnel Costs

An expected long-term benefit of the automated system was a reduction in personnel costs in the Patient Administration Section. Neither baseline data nor historical documentation of personnel pay are available for the period before the first TRIPAD module was installed (FY1980). Therefore, no comparison of dollars paid can be made. The number of personnel employed in each of the affected offices before and after implementation was determined, however, and these data are presented in Table 8.

Table 8

STAFFING LEVELS IN OFFICES AFFECTED BY TRIPAD
(Number of Full-Time Employees)

	<u>Pre-Implementation</u>	<u>Post-Implementation</u> ^b
R/ADT	8 ^a	8
Clinical Records	9 ^a	10
Business Office	5 ^b	5

^aBaseline data collected February - April, 1980.

^bInterview data collected October - 1983.

These data indicate that the total staff in the affected offices has increased one FTE or about 5%. This result, however, is misleading because the employee added has virtually no interaction with the TRIPAD system. In the office where the increase occurred, the number of personnel dedicated to the tasks supported by TRIPAD decreased from five to three (the two surplus slots were shifted to other duties unaffected by the automated system). This implies a net reduction of two out of 18 FTE in TRIPAD-supported functions or a staff reduction of 11%.

F. PATIENT SATISFACTION

Another expected benefit of the TRIPAD System was an improvement in overall patient satisfaction with matters related to Patient Administration (PA). The indicator of satisfaction was taken to be the number of patient complaints concerning Patient Administration matters.

No baseline data were collected on this subject. Also, results of the Hospital Services Office patient surveys, which are completed by a random sample of departing patients, are not available prior to

February 1982 (nearly one year after the R/ADT module became operational). Therefore, supervisors in Patient Affairs, R/ADT, and Business Offices were asked about patient complaints and whether the frequency or number of complaints has changed since the TRIPAD system was installed. All those interviewed stated that patient complaints were minimal and no noticeable change had occurred.

Formal (written) complaints are channeled through the Patient Affairs Office and number about five per year. These rarely deal with Patient Administration matters. Informal complaints heard by the R/ADT Supervisor usually focus on the length of time patients must wait for beds. This issue is primarily a function of bed availability and outside the control of the Patient Affairs Office.

Informal complaints heard in the Business Office usually result from misunderstandings concerning billing procedures on the part of patients, also outside the control of the Patient Affairs Office. Although some complaints focus on billing errors, these are few, and the Business Office module has not been operational for a sufficient period of time to detect any changes.

G. STAFF SATISFACTION

A survey was taken in the three offices that work with the TRIPAD System, R/ADT, Clinical Records, and Business Offices. The purpose was to gauge the level of satisfaction with the system felt by personnel in those offices. The questionnaire is presented in Appendix B and results are presented in Appendix C. The overall satisfaction rating (weighted by importance*) on 17 issues was 3.42 where 4.0 was the highest level of satisfaction. When asked to comment on seven undesirable occurrences, respondents indicated that such occurrences were rare or they didn't know. When asked to compare the present frequency of these occurrences with the frequency under manual procedures, most respondents felt that the undesirable situations occurred less frequently with TRIPAD. Respondents tended to agree strongly on five positive statements about the system. Finally, respondents agreed that the system was easy to learn and use. In summary, the results indicate that the staff is satisfied with the TRIPAD system.

* Refer to Appendix C for a discussion of weighting procedure.

IV. CONCLUSIONS

Table 9 presents the evaluation results in terms of the stated objectives. These data indicate that 13 of the 28 criteria identified in Section II have been met. Six of the original criteria were omitted from the analysis due to insufficient data or due to changes in the intended functions of TRIPAD since the criteria were established.

Of the nine objectives that were not met, five are related to the time required in the registration/admission process. This increased time is, in part, due to the TRIPAD system. For example, the new tasks of entering registration and admission data at the terminal are imposed by the system. Other components of this increase are due to external factors such as bed limitations and procedural changes, which are not impacted by the system.

Two of the objectives which were judged to be not met, changes in unidentifiable result reports and patient satisfaction, were not directly measurable, and the results are based on interviews with personnel in the affected areas. In both cases, the interviewees did not feel that issues had ever been a problem and stated that there was no noticeable change. These results, however, may not accurately reflect the changes. Since those interviewed may not have been sensitive to the issues in the past, they may not be aware of subtle changes that have occurred.

The last two objectives which were not met focus on nursing staff time. The main reason these were not achieved is that the ward personnel do not have access to the patient data base and, therefore, cannot ensure that it is up to date. In fact, the R/ADT office depends on a daily review of the bed occupancy lists (generated in the wards) to update the patient files in the TRIPAD system.

One step toward meeting these objectives would be to put terminals in the wards and revise procedures so that ward personnel would confirm patient arrival and notify the system when patients are

Table 9

SUMMARY OF SYSTEM OBJECTIVES AND SYSTEM PERFORMANCE
(AT THE TIME OF POST-IMPLEMENTATION DATA COLLECTION)

Objectives		Achieved	Not Yet Achieved	Omitted
<u>A. Personnel Productivity</u>				
1. Reduce time per unit of workload in:				
a. R/ADT				
b. Clinical Records				
c. Business Office				
2. Reduce personnel time for admission and disposition functions:				
a. collecting patient registration information;				
b. retrieval of previous registration data;				
c. number of times patient registration data are collected; and				
d. time devoted to producing Medical Treatment Recording Card (MTRC).				
3. Reduce personnel time to complete routine activities by availability of patient registration/admission data.				
4. Eliminate time devoted to the Patient Strength Report.				
5. Eliminate time to maintain the patient information file.				
6. Eliminate individual ward Bed Occupancy Lists.				
7. Reduce nursing staff time devoted to clerical activities.				
<u>B. Training Time (Decrease in Time)</u>				

Table 9

SUMMARY OF SYSTEM OBJECTIVES AND SYSTEM PERFORMANCE
(AT THE TIME OF POST-IMPLEMENTATION DATA COLLECTION)
(Continued)

Objectives	Not Yet		
	Achieved	Achieved	Omitted
<u>C. Patient Time</u>			
1. Reduce average length of stay attributable to patient administration.		o	
2. Reduce average patient waiting time.		o	
3. Reduce average patient time for			
a. admission		o	
b. discharge		o	
4. Reduce time for admission and disposition of active duty personnel.		o	
<u>D. Patient Service</u>			
1. Reduce number of unidentifiable result reports (laboratory, radiology, etc.).		o	
2. Reduce number of outpatients seen without a complete medical record.			o
3. Increase system security and data privacy.			o

Table 9

SUMMARY OF SYSTEM OBJECTIVES AND SYSTEM PERFORMANCE
(AT THE TIME OF POST-IMPLEMENTATION DATA COLLECTION)
(Continued)

Objectives	Not Yet		
	Achieved	Achieved	Omitted
<u>E. Financial Benefits</u>			
1. Increase collection of monies for pay services.	0		
2. Eliminate preprinted registration forms.			0
3. Decrease personnel costs.	0		
4. Decrease non-personnel costs.			0
5. Decrease total operating cost.			0
<u>F. Patient Satisfaction (Decrease Patient Complaints)</u>			
		0	
<u>G. Staff Satisfaction (Increase in Satisfaction)</u>			
	0		

discharged. This would ensure that the data are sufficiently current to eliminate the bed occupancy lists. The majority of clerical activities performed by nurses, however, have to do with documenting patient treatments and ordering diagnostic tests. These duties will not be supported by the TRIPAD system alone, but TRIPAD interfaced with other automated systems (TRIPHARM, TRILAB, TRIRAD, etc.) will provide a means of supporting some of the duties.

Many of the objectives of the system overlap and, therefore, appear to overstate the benefits. Table 10 presents a distilled picture of the benefits documented in this evaluation. These results show that the two most striking benefits result from supporting the Clinical Records Office and the ad hoc reporting capability of the system. In the Clinical Records Office, the system serves as a sophisticated word processor which automatically identifies coding errors and permits easy error correction. This capability results in a personnel time savings equivalent to two FTE.

The largest single benefit identified was attributed to the information availability provided by the system reporting capability discussed in Section III-A-3. Data (primarily from interviews) indicate that these reports save an equivalent of three full-time employees. This saving should also increase with time as the hospital staff become aware of the information available and how they can use it. This result implies that the maximum benefit in this area can be achieved by providing the MTF with maximum flexibility in creating reports that meet the needs identified by the facility staff.

In addition to the benefits noted above, two nonquantifiable benefits were noted. Staff satisfaction with the system itself appears quite high as evidenced by the staff survey. TRIPAD may contribute to a more general feeling of job satisfaction. Nursing Office personnel commented that the workload information available can lead to an improved allocation of personnel resources and result in improved staff morale.

Finally, a significant, although nonquantifiable, benefit is a possible improvement in patient care. Nursing personnel stated that the improved resource allocation noted above also improves the care provided with the available resources. In addition, the Infection

Table 10

DOCUMENTED BENEFITS OF THE TRIPAD SYSTEM

Office	Benefit	Value	Annual Benefit (hr/yr)
R/ADT	Patient admissions	-2.9 min/admission	-534
	Maintaining information file	0.8 min/admission	147
Clinical	Coding Clinical Record Cover Sheet	2 FTE	4160
	Maintaining Accounts Receivable	24.5 min/day	106
Business Office	Capturing registration data	0.8 min/admission	147
	Information availability	23.8 hr/day	6188
All			
		TOTAL	10214 (4.9 FTE)

Nonquantifiable Benefits:

- o MTF staff satisfaction
- o Improved patient care

Control Nurse noted that data in the system could help her identify areas where hospital-spread infections are problematic, and as a result help to reduce the incidence of these infections. Finally, several of the staff members interviewed noted that the information available greatly improves bed management by identifying patients who may be ready for discharge. This minimizes each patient's hospital stay, and as a result, maximizes the number of patients that can be treated at the facility.

REFERENCES

1. Arthur D. Little, Inc., Preliminary Economic Analysis of the TriService Patient Administration (TRIPAD) System with Interfaces, prepared for TRIMIS Program Office, June 29, 1983.
2. Arthur D. Little, Inc., Preliminary Economic Analysis of the TriService Phase II System (Draft Report), prepared for TRIMIS Program Office, September 15, 1983.
3. Analytic Services, Inc., Results of Period X Data Collection for the Evaluation of the TriService R/ADT System (Initial Capability) at Keesler AFB. (Working Papers), November, 1980.
4. Arthur D. Little, Inc., Results of the Period X Data Collection Business Office/Medical Service Account Section of the Medical Resource Management Office, USAF Medical Center, Keesler, prepared for TRIMIS Program Office, December 15, 1981.
5. Arthur D. Little, Inc., Interim Status Report on TRIPAD Implementation at Keesler AFB (Report No. 0209-2-PAD-2-Keesler-I-1) submitted to TRIMIS Program Office, June 23, 1982.
6. Arthur D. Little, Inc., Interim Status Report on TRIPAD Implementation at Keesler AFB (Report No. 0209-2-PAD-Keesler-I-2), submitted to TRIMIS Program Office, October 29, 1982.
7. Arthur D. Little, Inc., Interim Status Report on TRIPAD Implementation at Keesler AFB (Report No. 0209-2-PAD-2-Keesler-I-3), submitted to TRIMIS Program Office, June 30, 1983.
8. TRIMIS Program Office, Functional Description for Patient Administration (Draft), January 15, 1981.
9. TRIMIS Program Office, Initial Project Objectives and Evaluation Criteria, Revised April 1978.

APPENDIX A

SUMMARY OF TRIPAD EVALUATION CRITERIA AND INFORMATION AVAILABLE

Table 1

SUMMARY OF TRIPAD EVALUATION CRITERIA AND INFORMATION AVAILABLE

Criterion	Measure	Baseline Data Collected	Recoverable Baseline Data	Collection Technique	Purpose for Collection
1. The number of patients expressing satisfaction with the handling of administrative matter should increase by 20% to 50% [Ref. MRG-1]	Number of unsolicited patient complaints concerning Patient Affairs	None	Interview personnel who have experience with both systems for subjective assessment of patient satisfaction	Interview	3
To decrease by 25% to 50% the number of unsolicited formal complaints concerning patient dissatisfaction with the patient administration system [Punc. Desc. 2.2.1.1.6] [MRG-10]					
2. The number of hospital and related regional medical staff having contact with the patient administration system who are satisfied with the system performance should increase by 50% to 75% [Ref. MRG-2]	Survey of staff satisfaction with Patient Affairs system	None (ANSER job satisfaction survey does not address criterion)	Survey personnel with experience under both systems for subjective evaluation	Survey	3
3. The productivity of patient administration personnel should increase by 20% to 30% [MRG-3]	Time required to: a) Register and admit a patient b) Review Clinical Record and Clinical Record cover sheet c) Reconcile Accounts Receivable	Timed data BO only (ANSER data does not reference work loads)	R/ADT, CR data can be scaled based on post-implementation work loads	Work Sampling Interview	1, 2
4. The identification and collection of monies due the Federal government for pay services should increase by 10% to 25% [MRG-4], [Punc. Desc. 2.2.1.2.3]	Rate of growth of delinquent fees transferred to BAFO normalized by month, patient load and inflation	o Monthly sales and funds collected FY 81 o Current, past due and delinquent accounts receivable, November 81	Monthly Medical Service Activity Reports	Interview	2
5. In treatment centers that maintain a medical record, the number of patients seen without a medical record or with an incomplete medical record should decrease by 50% [MRG-5]	Number of clinic patients seen without a complete medical record	None	None	Onsite criterion	

Key:

- 1 = Useful for present TRIPAD EA
- 2 = Useful for future TRIPAD, CHCS EA
- 3 = Address criterion only

Table 1 (Continued)

SUMMARY OF TRIPAD EVALUATION CRITERIA AND INFORMATION AVAILABLE

Criterion	Measure	Baseline Data Collected	Recoverable Baseline Data	Collection Technique	Purpose for Collecting
6. The number of loose elements (e.g., laboratory reports, X-ray reports) which cannot be returned to the requesting unit because of inadequate information should decrease by 25% to 50% [NRG-6]	Number of unidentifiable elements in the labs	None (Number of unfiled result reports received by outpatient records)	Interview Lab personnel for subjective evaluation of the impact of PAD on the number of loose elements	Interview	1, 2
7. The average time spent by administration for the admission and disposition functions should decrease by 25% to 50% [NRG-7]	Fraction of ASD personnel time devoted to ASD functions	<ul style="list-style-type: none"> % total personnel o complete AF-560; o determine bed availability; o prepare addressograph wristband; o imprint forms; o assemble chart; o sort, stamp, file, record o process dispositions 	Baseline data sufficient	Work Sampling	1, 2
8. The average patient waiting time for inpatient admission procedures by time of day, day of week, and kind of admission, should decrease by 10% to 20% [NRG-8]	Time span between patient entrance to ASD area and the beginning of registration	<ul style="list-style-type: none"> o average total patient time between when he enters the registration area and when he 			

Key:

- 1 - Useful for present TRIPAD EA
- 2 - Useful for future TRIPAD, CHCS EA
- 3 - Address criterion only

Table 1 (Continued)

SUMMARY OF TRIPAD EVALUATION CRITERIA AND INFORMATION AVAILABLE

Criterion	Measure	Baseline Data Collected	Recoverable Baseline Data	Collection Technique	Purpose for Collecting
9. The amount of patient time required for the patient to be admitted, discharged, or to effect a change in status should decrease by 30% to 40% (NRG-9)	Time required for: registration admission disposition transfer by patient type Total Patient Administration payroll normalized by admissions and inflation	o time includes waiting, registration, admission; o categories include inpatient and quarters only	o time includes waiting, SMTF data from Fairchild	Timed Observation	2
10. Personnel costs associated with the patient administration system, normalized by workload, should decrease by 5% to 25% (NRG-11)		None	Total patient administration payroll FY 80	Interview	3
11. The portion of the average length of stay attributable to the administrative process should decrease by 50% (NRG-12) Decrease by 50% within two years that portion of the average length of stay attributable to administrative processing (Func. Des. 2.2.1.8)	Sum of time required for: waiting registration admission disposition/transfer Business Office clearance by patient type o The length of time before new staff become proficient o The amount of supervisor time invested in training	Total waiting, registration, admission, BO-charge	Baseline data sufficient	Timed Observation	2
12. The average amount of time required to train patient administration personnel should change by -10% to 10% (NRG-13) To reduce by 20% within two years, the average amount of time required to train patient administrative personnel (Func. Des. 2.2.1.1.9)		Estimates of training time provided by office supervisors	Personnel interviews with Patient Affairs supervisors to verify Period X data	Interview	1, 2
13. Nonpersonnel operating cost of the patient administration, normalized by workload, should change by -5% to 25% (NRG-14)	Patient Administration annual supply cost normalized by admissions and inflation	None (consumable supply costs for Feb/Mar 1980)	Unknown	Interview	1, 2

Key:

- 1 = Useful for present TRIPAD EA
- 2 = Useful for future TRIPAD, CHCS EA
- 3 = Address criterion only

Table 1 (Continued)

SUMMARY OF TRIPAD EVALUATION CRITERIA AND INFORMATION AVAILABLE

Criterion	Measure	Baseline Data Collected	Recoverable Baseline Data	Collection Technique	Purpose for Collecting
14. To provide system security and data privacy to reduce unauthorized access to zero percent [Func. Des. 2.2.1.1.1]	The number of unauthorized accesses to patient records	None	None	Omit criterion	
15. Provide a savings of 520 hours per year of level GS-3 time by providing accurate and timely patient data for medical and administrative needs [Func. Des. 2.2.1.1.3]	Personnel time saved by ad hoc reports	None	Interview personnel to estimate time to complete selected tasks before reports were available	Interview	1, 2
16. Reduce by a TRINIS-determined percentage the redundant capture of data by providing the accurate and timely exchange of common data between functional areas [Func. Des. 2.2.1.1.4]	The number of times registration data is collected in R/ADT, Business Office, and Labs	None	None	Interview	1, 2
17. To realize a potential annual savings of approximately \$74,000 over manual PAD systems [Func. Des. 2.2.1.1.10]	Total Patient Administration cost resulting from personnel and supply cost reductions (criteria 10 and 13) normalized by admissions and inflation	None	Unknown	Interview	3
18. To reduce from seven minutes to five the time required for the entry of initial encounter registration data [Func. Des. 2.2.1.2.1.1]	Time to enter patient registration by patient type	None	SHTF data from Fairchild	Timed Observation	1, 2
19. To eliminate the personnel time currently devoted to the production of the Medical Treatment Recording Card (MTRC). This may be translated into an annual savings of 7265 hours at GS-3 rates [Func. Des. 2.2.1.2.1.2]	Personnel time to produce MTRC	o Time to produce addressograph plates in Out-patient Records; o % time devoted to production of cards in R/ADT	Interview personnel, identify differences between outpatient and inpatient addressograph plates	Interview	1, 2

Key:

- 1 = Useful for present TRIPAD EA
- 2 = Useful for future TRIPAD, CHCS EA
- 3 = Address criterion only

Table 1 (Continued)

SUMMARY OF TRIPAD EVALUATION CRITERIA AND INFORMATION AVAILABLE

Criterion	Measure	Baseline Data Collected	Recoverable Baseline Data	Collection Technique	Purpose for Collecting
20. Eliminate the preprinted DOD registration forms. At a cost of \$0.05/form, this may amount to an annual savings of \$6,900 [Func. Des. 2.2.1.2.1.3]	Cost of preprinted registration forms	None	None	Omit criterion	
21. Eliminate the manual retrieval of patient identification (PTID) and demographic for the checking of prior registration records. The automated procedure can annually save 520 hours at GS-3 rates [Func. Des. 2.2.1.2.1.4]	Time required to retrieve previous registration data	Not previously practiced	Interview personnel to verify that previous PTID data were not retrieved	Interview	1, 2
22. Eliminate personnel time assigned to the preparation of the nominal index (patient information file). This may result in a savings of 1533 hours/year at GS-3 rates [Func. Des. 2.2.1.2.2.1]	Time required to maintain patient information file	% total time to maintain 3x5 card files	Baseline data sufficient	Work Sampling	2
23. Eliminate personnel time devoted to the preparation of the patient population report. This may afford an annual savings of 387 hours at GS-4 rates [Func. Des. 2.2.1.2.2.2]	Personnel time to produce Patient Strength Report	None	Interview personnel to verify that Patient Strength Report previously consumed personnel time	Interview	2
24. Eliminate the manual, individual ward/bed occupancy lists that are currently maintained by the clerks in the nursing units and to replace them with an automated, consolidated ward/bed occupancy report. This may be translated into an annual savings of 1,825 hours at GS-5 rates [Func. Des. 2.2.1.2.2.3]	Personnel time to produce Ward/Bed Occupancy lists	Nursing service personnel time to produce Ward/Bed Occupancy lists	Baseline data sufficient	Interview	1, 2
25. Reduce the time spent on the admission and disposition of active duty personnel to effect an annual savings of 3150 hours at E-5 rates [Func. Des. 2.2.1.2.2.4]	Total time required for: waiting admitting dispositioning Business Office clearance of active duty personnel	See data for Criteria 8 and 9. Assume time for military personnel same as average.	Baseline data sufficient	Time Observation	2

Key:

- 1 - Useful for present TRIPAD EA
- 2 - Useful for future TRIPAD, CHCS EA
- 3 - Address criterion only

Table 1 (Continued)

SUMMARY OF TRIPAD EVALUATION CRITERIA AND INFORMATION AVAILABLE

Criterion	Measure	Baseline Data Collected	Recoverable Baseline Data	Collection Technique	Purpose for Collecting
26. Reduce by 4% the amount of time devoted by nursing staff to clerical activities [Func. Des. 2.2.1.2.2.5]	Total nursing staff time devoted to clerical activities	o Nursing personnel time to prepare the Nursing Service 24-Hour Report o Nursing personnel time to prepare the Consolidated Ward/Bed Occupancy by Specialty Report	None	Interview	2
27. Decrease by a TRIMIS-determined percentage the time required to access files, produce updated reference tables, track system use, produce ad hoc reports as requested [Func. Des. 2.2.1.2.4]	o Time required to access patient registration files o Personnel time to produce reports o Total time to track system o Time to produce ad hoc reports	o Information Desk personnel time to answer inquiries o Add personnel time to produce: a) bed status work sheet b) A&D sheet c) Alpha Roster (Register of Patients) d) SI/WSI list	o Personnel time to access and produce reports o Interview for change in time needed to track system use and produce ad hoc reports	Interview	3

Key:

- 1 = Useful for present TRIPAD EA
2 = Useful for future TRIPAD, CHCS EA
3 = Address criterion only

APPENDIX B
POST-IMPLEMENTATION DATA COLLECTION INSTRUMENTS

WORK SAMPLING FORM - R/ADT

Page of

Shift Codes: 1 Day
2 Evening
3 Night

Day Codes:

1	Monday
2	Tuesday
3	Wednesday
4	Thursday
5	Friday
6	Saturday
7	Sunday

Staff Type: 1 Office Supervisor
 2 Office Clerk
 3 Other

Activity Codes

PATIENT R/ADT:

- 10 Complete AF560
- 11 Enter Registration Data
- 12 Enter Admission Data
- 13 Determine Bed Availability
- 14 Update Bed Status Worksheet
- 15 Prepare Addressograph Plate
- 16 Imprint Forms, Wrist Bands
- 17 Assemble Patient Chart
- 18 Enter Disposition, Transfer Data
- 19 Other R/ADT Functions

Clerical Activities:

- 30 Sort, Stamp and File Clinical Records
31 Attach Labels to 3x5 Cards
32 Disperse and File 3x5 Cards
33 Pull Clinical Record/Insert Chart
34 File Quarters Patient Outpatient Record
35 Pull Quarters Patient Outpatient Record
36 Requisitioning Supplies

Report Generation:

- 40 Cross Check Bed Status with Nursing Service 24-Hour
41 Transcribe Bed Status Sheet
42 Other Report Preparation

Other Terminal Activities:

- 50 Update SI/VSI File
51 Retrieving Patient Data

Other Activities:

- 60 Searching Card File for Patient Data
61 Servicing Equipment

Away from Area:

- 74 Training
75 Meeting/Seminars
76 Getting Supplies
77 Clinical Records
78 On Ward
79 Computer Center
80 Personal/Meal
81 Other
82 Unknown

Communication With:

- 90 Telephone
91 Medical Staff
96 Other Staff - R/ADT
97 Other Staff - Non-R/ADT
98 Patient and/or Family

WORK SAMPLING FORM - BUSINESS OFFICE

Period	$\frac{1}{1}$	Period	$\frac{1}{2}$	Unit	$\frac{2}{3}$	Shift	$\frac{4}{4}$	Day	$\frac{5}{5}$	Time	$\frac{6}{6}$	$\frac{7}{7}$	$\frac{8}{8}$	$\frac{9}{9}$
--------	---------------	--------	---------------	------	---------------	-------	---------------	-----	---------------	------	---------------	---------------	---------------	---------------

Name	Staff Type	Primary Activity	Activity Two	Activity Three	Page ____ of ____
	10	11 / 12	13 / 14	15 / 16	<u>Shift Codes:</u> 1 Day 2 Evening 3 Night
					<u>Day Codes:</u> 1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday 7 Sunday
					<u>Staff Type:</u> 1 Office Supervisor 2 Office Clerk 3 Other
					<u>Activity Codes</u> <u>Window Transactions:</u> 11 Create Voucher/Acknowledgement of Indebtedness at Terminal 12 Count Money 13 Input Transaction at Terminal 14 Other Terminal Activities
		TIME 6 / 7 / 8 / 9			<u>Clerical/Bookkeeping Activities:</u> 20 File Voucher/Acknowledgement of Indebtedness 21 Fill in Form AF1087 22 Fill in Form AF1139 23 Complete AF 1091 24 Complete AF544 25 Check AF544 against AF546 26 File AF544 and AF1091 27 Photocopy AF1339 28 Fold Letters and Stuff Envelopes 30 Search Suspense Files 31 Type Information on DD1131 32 Type SF1080 33 Type DD-7A 34 Transcribe VA Names on AF3143 35 Reconcile Cash on Hand with Draft DD1131
	10	11 / 12	13 / 14	15 / 16	<u>Accounting Officer of the Day (AOD) Activities:</u> 40 Inventory AOD Envelopes 41 Balance Patients' Trust Fund 42 Write Receipts 43 Brief AOD (Evening)
		TIME 6 / 7 / 8 / 9			<u>Other Activities:</u> 50 Review A&D Sheet 51 Repair Equipment
	10	11 / 12	13 / 14	15 / 16	<u>Away from Area:</u> 70 Pick Up A&D Sheet 71 Deliver Vouchers to Accounting and Finance 72 Deliver DD1131 to BAFO 73 Deliver Month-to-Date Bills to BAFO 74 Training 75 Meeting/Seminar 76 Getting Supplies 79 Computer Center 80 Personal/Meal 81 Other 82 Unknown
					<u>Communication:</u> 90 Telephone 91 Medical Staff 92 Other Staff - BO 93 Other Staff - Non-BO 98 Patient and/or Family

QUESTIONNAIRE

1-6

Your answers to the following questions will help evaluate satisfaction with the present patient administration (TRI-PAD) operation within this hospital. Please answer the questions on each page and return this questionnaire as instructed. Response will be kept confidential.

1. Listed below are general characteristics of the TRI-PAD operation. In the first section please indicate your rating of the IMPORTANCE of each; in the second section please rate your CURRENT SATISFACTION with each at this medical treatment facility by marking an X under the column that best describes your opinion where applicable. Space has been provided for comments about satisfaction at the end of this section. If you do not know, or the question is not applicable to you, please mark the column so headed.

<u>FIRST, RATE THE IMPORTANCE:</u>	<u>Very Important</u>	<u>Somewhat Important</u>	<u>Undecided as to Importance</u>	<u>Not Very Important</u>	<u>Don't Know or Not Applicable</u>	
a. Availability of complete registration information on patients	1 _____	2 _____	3 _____	4 _____	5 _____	7
b. Accuracy of patient registration information	1 _____	2 _____	3 _____	4 _____	5 _____	8
c. Access to patient registration information	1 _____	2 _____	3 _____	4 _____	5 _____	9
d. Timely updating of registration information	1 _____	2 _____	3 _____	4 _____	5 _____	10
e. Time required to generate daily R/ADT reports	1 _____	2 _____	3 _____	4 _____	5 _____	11
f. Access to patient location information	1 _____	2 _____	3 _____	4 _____	5 _____	12
g. Time required to check daily R/ADT reports	1 _____	2 _____	3 _____	4 _____	5 _____	13
h. Ease of generating clinical record cover sheet	1 _____	2 _____	3 _____	4 _____	5 _____	14
i. Availability of data for monthly workload reports	1 _____	2 _____	3 _____	4 _____	5 _____	15
j. Availability of data for UCA quarterly report	1 _____	2 _____	3 _____	4 _____	5 _____	16
k. Time spent on the disposition function	1 _____	2 _____	3 _____	4 _____	5 _____	17
l. Availability of patient information needed for disposition	1 _____	2 _____	3 _____	4 _____	5 _____	18
m. Elimination of multiple and redundant patient registrations	1 _____	2 _____	3 _____	4 _____	5 _____	19
n. Accuracy of hospital census and bed availability	1 _____	2 _____	3 _____	4 _____	5 _____	20
o. Accuracy of information related to charges and billings	1 _____	2 _____	3 _____	4 _____	5 _____	21
p. Availability of patient charge and billing information	1 _____	2 _____	3 _____	4 _____	5 _____	22
q. Number of delinquent accounts	1 _____	2 _____	3 _____	4 _____	5 _____	23

NOW, RATE YOUR SATISFACTION:	Very Satisfied	Somewhat Satisfied	Undecided as to Satisfaction	Not Very Satisfied	Not at All Satisfied	Don't Know or Not Applicable	
a. Availability of complete registration information on patients	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	2-
b. Accuracy of patient registration information	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	25
c. Access to patient registration information	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	26
d. Timely updating of registration information	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	27
e. Time required to generate daily R/ACT reports	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	28
f. Access to patient location information	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	29
g. Time required to check daily R/ACT reports	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	30
h. Ease of generating clinical record cover sheet	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	31
i. Availability of data for monthly workload reports	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	32
j. Availability of data for JCA quarterly report	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	33
k. Time spent on the disposition function	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	34
l. Availability of patient information needed for disposition	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	35
m. Elimination of multiple and redundant patient registrations	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	36
n. Accuracy of hospital census and bed availability	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	37
o. Accuracy of information related to charges and billings	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	38
p. Availability of patient charge and billing information	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	39
q. Number of delinquent accounts	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	40

Comments: _____

2. How often would you say the following occurs with the TRI-PAD system?

	Often	Occasionally	Undecided or Don't Know	Rarely	Never	Applicable	
a. Errors in patient registration information	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	-3
b. Multiple registrations for the same patient	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	-4
c. Difficulty in determining patient's room	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	-3
d. Errors in reported patient location	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	-5
e. Errors in preparation of clinical record cover sheet	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	-7
f. Delays in preparation of clinical record cover sheet due to incomplete or late return of records to medical records	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	49
g. Errors in the coding transcript (AF 1366, AF 1367)	1 _____	2 _____	3 _____	4 _____	5 _____	6 _____	49

3. Did you work at this facility before January 1981 when TRI-PAD was installed?

_____ 1. Yes

_____ 2. No (If No, please go to Question 5.)

If you worked here before TRI-PAD was installed, please rate the relative frequency of the following events with TRI-PAD compared to the previous manual R/ADT operations.

	More Frequently With TRI-PAD	Similar Frequency With TRI-PAD	Undecided or Don't Know	Less Frequently With TRI-PAD	Never With TRI-PAD	
a. Errors in patient registration information	1 _____	2 _____	3 _____	4 _____	5 _____	51
b. Multiple registrations for the same patient	1 _____	2 _____	3 _____	4 _____	5 _____	51
c. Difficulty in determining patient's room	1 _____	2 _____	3 _____	4 _____	5 _____	51
d. Errors in reported patient location	1 _____	2 _____	3 _____	4 _____	5 _____	51
e. Errors in preparation of clinical record cover sheet	1 _____	2 _____	3 _____	4 _____	5 _____	51
f. Delays in preparation of clinical record cover sheet due to incomplete or late return of records to medical records	1 _____	2 _____	3 _____	4 _____	5 _____	51
g. Errors in the coding transcript (AF 1366, AF 1367)	1 _____	2 _____	3 _____	4 _____	5 _____	51

4. The following statements describe opinions about the TRI-PAD system. Please indicate the extent to which you agree with each statement by marking an X in the appropriate column.

	<u>Agree Strongly</u>	<u>Agree Somewhat</u>	<u>Undecided</u>	<u>Disagree Somewhat</u>	<u>Disagree Strongly</u>	
a. The automated system makes my job easier	1 _____	2 _____	3 _____	4 _____	5 _____	55
b. The automated system makes my work more efficient	1 _____	2 _____	3 _____	4 _____	5 _____	59
c. The automated system makes my work more challenging	1 _____	2 _____	3 _____	4 _____	5 _____	60
d. The automated system reduces the number of people needed to handle the work	1 _____	2 _____	3 _____	4 _____	5 _____	61
e. The automated system reduces the number of errors	1 _____	2 _____	3 _____	4 _____	5 _____	62

5. Please indicate the extent of your agreement with the following statements about using the system.

	<u>Agree Strongly</u>	<u>Agree Somewhat</u>	<u>Undecided</u>	<u>Disagree Somewhat</u>	<u>Disagree Strongly</u>	
a. It did not take a lot of time to learn to use it	1 _____	2 _____	3 _____	4 _____	5 _____	63
b. It is easy to use	1 _____	2 _____	3 _____	4 _____	5 _____	64

6. Please indicate the location in which you work.

- _____ 1. R/ADT
 _____ 2. Clinical Records
 _____ 3. Business Office
 _____ 4. Other _____ (Please specify)

7. How long have you worked at this hospital? (Mark one)

- _____ 1. 0-6 months
 _____ 2. 7-12 months
 _____ 3. 13-24 months
 _____ 4. 25-36 months
 _____ 5. More than three years (specify how many _____.)

8. Are you in the military? (Mark one)

- _____ 1. Yes
 _____ 2. No

9. Comments _____
- _____
- _____
- _____

Thank you for your time and effort. Please return this questionnaire in the envelope provided to _____.

APPENDIX C
POST-IMPLEMENTATION DATA COLLECTED

WORK SAMPLING DATA

R/ADT

Employees Observed	7
Total hours observed	18.0
Total Admissions	
Inpatient	51
Quarters	2
Total Dispositions	
Inpatient	33
Quarters	1

TABLE 2

WORK SAMPLING SUMMARY - R/ADT

PATIENT R/ADT	SUPERVISOR			OFFICE CLERK			OVERALL		
	PRIMARY	ACTIVITY TWO	ACTIVITY THREE	PRIMARY	ACTIVITY TWO	ACTIVITY THREE	PRIMARY	ACTIVITY TWO	ACTIVITY THREE
COMPLETE AF560	2	1	1	30	7	4	32	8	5
ENTER REGISTRATION DATA	1	1	-	9	33	4	10	34	4
ENTER ADMISSION DATA	1	-	2	31	6	12	32	6	14
ENTER/RECORD AVAILABILITY	-	1	-	11	7	5	11	8	5
UPDATE RED STATUS WORKSHEET	1	-	1	9	1	1	10	1	2
PREPARE ADDRESSOGRAPH PLATE	1	-	-	2	2	1	3	2	1
IMPRINT FORMS, WRIST BANDS	-	3	-	3	24	2	3	27	2
ASSEMBLE PATIENT CHART	7	2	-	30	4	1	37	6	1
ENTER DISPOSITION, TRANSFER DATA	4	1	-	19	2	2	23	3	2
CLERICAL ACTIVITIES	-	-	-	4	-	-	4	-	-
TYPING (UNSPECIFIED)	-	-	-	2	-	-	2	-	-
MEETLY ACTIVITIES REPORT	-	-	-	5	-	-	5	-	-
PHOTOGRAPH REPORTS	-	-	-	7	-	-	7	-	-
DISTRIBUTE VSI + ADD SHEETS	-	-	-	1	-	-	1	-	-
SEAL, STAMP AND FILE CLINICAL RECORDS	-	-	-	12	2	-	12	2	-
DISPENSE AND FILE 3X5 CARDS	-	-	-	14	-	-	14	-	-
PULL CLINICAL RECORD/INSECT CHART	-	-	-	-	-	-	-	-	-
REPORT GENERATION	-	-	-	5	2	-	5	2	-
CROSS CHECK RED STATUS WITH CORRESPONDING SERVICE PM NUMBER	-	-	-	-	-	-	-	-	-
OFFICE/REGISTRATION AND DRIFT	-	-	-	2	-	-	2	-	-

PERCENT PRIMARY

TABLE 2
CONTINUED -1

C O U N T E R O F O B S E R V A T I O N S

	SUPERVISOR		OFFICE CLERK		OVERALL		PERCENT PRIMARY
	PRIMARY	ACTIVITY THRU	PRIMARY	ACTIVITY THRU	PRIMARY	ACTIVITY THRU	
CHECKING FINAL AND LIST	-	-	2	-	2	-	.5
OTHER TECHNICAL ACTIVITIES	-	-	2	-	2	-	.5
UPDATE STAFFS FILE	1	-	-	2	1	2	.2
RETRIEVING PATIENT DATA	-	-	-	-	-	-	-
OTHER ACTIVITIES	-	-	-	-	-	-	-
SEARCHING CARD FILE FOR PATIENT DATA	-	1	2	6	2	7	.5
SERVICING EQUIPMENT	-	-	-	-	-	-	-
ALAY FROM AREA	-	-	-	-	-	-	-
GETTING SUPPLIES	-	-	1	-	1	-	.2
CLINICAL RECORDS	3	-	1	1	4	1	.9
ON WARD	-	-	7	-	7	-	1.6
PERSONAL/HAL	1	-	12	-	13	-	3.0
OTHER	-	-	6	1	6	1	1.4
UNKNOWN	-	-	6	1	6	1	1.4
COMMUNICATIONS OTHER	-	-	-	-	-	-	-
TELEPHONE - VERIFY BED STATUS WORK SHIFT	-	-	2	-	2	-	.5
TELEPHONE	3	4	26	26	29	30	6.7
NEDICAL STAFF	-	-	2	-	2	-	.5
OTHER STAFF - N/MDT	29	2	69	14	98	16	22.7
OTHER STAFF - N/MDT/MDT	2	2	20	9	22	11	5.1
PATIENT AND/OR FAMILY	-	9	10	7	16	16	2.3
OTHER STAFF - N/MDT	9	-	-	-	9	-	2.1

WORK SAMPLING DATA
BUSINESS OFFICE

Employees Observed	3
Total Hours Observed	17.3
Total Window Transactions	56
Total Delinquent Letters Sent	38

TABLE 1

SUB-SAPPHIRE SUMMARY - BOSTON SS OFFICE

	SUPERVISOR				OFFICE CLERK				OVERALL				PERCENT PRIMARY
	ACTIVITY		THREE	PRIMARY	ACTIVITY		THREE	PRIMARY	ACTIVITY		THREE		
	PRIMARY	TOTAL			PRIMARY	TOTAL			PRIMARY	TOTAL			
WINDOW TRANSACTIONS													
DISCHARGE PATIENTS/PAY BILLS	-	-	-	39	15	-	-	39	15	-	-	6.4	
CREATE VOUCHER	1	1	-	10	29	12	12	11	30	12	12	1.8	
INPUT TRANSACTION AT TERMINAL	-	-	-	5	19	29	29	5	19	29	29	.8	
OTHER TERMINAL ACTIVITIES	15	11	1	20	22	10	10	33	33	11	11	5.5	
CLERICAL/BOOKKEEPING													
MAIL/POST PAYMENTS OF INDEBTEDNESS	5	2	-	21	3	-	-	26	5	-	-	4.5	
FILL IN FORM AF1037	-	-	-	-	2	-	-	-	2	-	-	-	
FILL IN FORM AF1154	-	-	-	37	5	1	1	37	5	1	1	6.1	
COMPLETE AF1091	-	-	-	19	14	1	1	19	14	1	1	5.1	
COMPLETE AF544	-	-	-	19	19	-	-	19	19	-	-	5.1	
CHECK AF544 AGAINST AF546	-	-	-	9	-	-	-	9	-	-	-	1.5	
PHOTOCOPY AF1339	-	-	-	2	-	-	-	2	-	-	-	.5	
FOLD LETTERS AND STUFF ENVELOPES	-	-	-	4	1	-	-	4	1	-	-	.7	
SEARCH SUSPENSE FILES	1	-	-	3	3	-	-	4	3	-	-	.7	
TYPE INFORMATION ON DD1151	-	-	-	6	-	-	-	6	-	-	-	1.0	
TYPE DD-74	-	-	-	30	1	2	2	30	1	2	2	5.0	
TRANSCHEM VA NAME'S ON AF3143	-	-	-	1	-	-	-	1	-	-	-	.2	
RECONCILE CASH ON HAND WITH DEFT DD1151	-	-	-	19	3	-	-	19	3	-	-	5.1	

TABLE 1
CONTINUED -2

NUMBER OF OBSERVATIONS

	SUPERVISOR			OFFICE CLERK			OVERALL			PERCENT PRIMARY
	PRIMARY	ACTIVITY TWO	ACTIVITY THREE	PRIMARY	ACTIVITY TWO	ACTIVITY THREE	PRIMARY	ACTIVITY TWO	ACTIVITY THREE	

ACCOUNTING OFFICE OF THE DAY
ACTIVITIES

INVENTORY AND ENVELOPES	-	-	-	1	1	-	1	1	-	.2
BRIEF AND (EVENING)	-	-	-	-	2	-	-	2	-	-
OTHER ACTIVITIES	-	-	-	1	-	-	1	-	-	.2
REPAIR EQUIPMENT	1	4	1	2	-	1	3	4	2	.5
TYPING (UNSPECIFIED)	-	-	-	12	-	-	12	-	-	2.0

AWAY FROM AREA

DELIVER VOUCHERS TO ACCOUNTING AND FINANCE	9	-	-	-	14	-	9	14	-	1.5
DELIVER BILLS TO BAFU	-	-	-	20	1	-	20	1	-	3.5
TRAINING	-	2	-	-	-	-	-	2	-	-
MEETING/SEMINAR	-	-	-	3	1	-	3	1	-	.5
GETTING SUPPLIES	-	-	-	-	1	-	-	1	-	-
COMPUTER CENTER	3	1	-	-	-	-	3	1	-	.5
PERSONAL/MEAL	6	-	-	33	2	1	39	2	1	6.4
OTHER	16	1	-	35	3	-	51	4	-	6.4
UNKNOWN	2	-	-	3	-	-	5	-	-	.4

COMMUNICATIONS

TELEPHONE	7	2	2	14	1	1	21	3	3	3.5
OTHER STAFF - HQ	6	4	-	3	-	-	9	4	-	1.5
OTHER STAFF - OFFICE	13	4	1	19	9	-	32	13	1	5.3
COAST GUARD JOURNAL PATIENT VOUCHERS	-	-	-	13	4	1	14	4	1	2.1

WORK SAMPLES FOR TABULATION

TABLE 1
CONTINUED -5

PATIENT AND/OR FAMILY SUPERVISOR ACTIVITIES INCLUDING END OF FY.	TOTALS OF OFFICE ACTIVITIES									
	SUPERVISOR			OFFICE CLERK			OVERALL			
	PRIMARY	ACTIVITY TWO	ACTIVITY THREE	PRIMARY	ACTIVITY TWO	ACTIVITY THREE	PRIMARY	ACTIVITY TWO	ACTIVITY THREE	PERCENT PRIMARY
-	-	1	-	-	-	2	-	3	-	-
119	119	5	-	-	-	-	119	5	-	19.7

STAFF SATISFACTION SURVEY

<u>Table</u>	<u>Score</u>	<u>Interpretation</u>	
		<u>Importance</u>	<u>Satisfaction</u>
1	1	Not very important	Not very satisfied
	2	Undecided	Undecided
	3	Somewhat important	Somewhat satisfied
	4	Very important	Very satisfied
2		Present Frequency	Comparison to Manual System
	0	Never	Never with TRIPAD
	1	Rarely	Less frequently with TRIPAD
	2	Undecided	Undecided
	3	Occasionally	Similar frequency
	4	Often	More frequently with TRIPAD
3,4	1	Disagree strongly	
	2	Disagree somewhat	
	3	Undecided	
	4	Agree somewhat	
	5	Agree strongly	

Weighting Procedure

The results presented in Table 1 that follow are weighted by importance. Respondents rated the importance of each issue and their satisfaction with the system. The average importance of each issue was determined as the numerical average of the responses ("not applicable" responses were omitted). The weighted satisfaction on each issue was then determined by the following formula:

$$\text{satisfaction} = \frac{\sum (\text{individual importance} \times \text{individual satisfaction})}{\sum \text{individual satisfaction}}$$

TABLE 1

IMPORTANCE AND SATISFACTION OF ISSUES BY WIPA CENTER

	OVERALL		H/ADP		CLINICAL RECORDS		BUSINESS OFFICE	
	IMPORTANCE	SATISFAC	IMPORTANCE	SATISFAC	IMPORTANCE	SATISFAC	IMPORTANCE	SATISFAC
AVAILABILITY OF COMPLETE REGISTRATION INFORMATION	4.00	3.60	4.00	3.50	4.00	3.80	4.00	3.50
ACCURACY OF REGISTRATION INFORMATION	4.00	3.40	4.00	3.29	4.00	3.50	4.00	3.50
ACCESS TO REGISTRATION INFORMATION	3.47	3.63	3.88	3.58	3.80	3.83	4.00	4.00
TIMELY UPDATING REGISTRATION INFORMATION	3.79	3.60	3.75	3.38	3.75	4.00	4.00	3.50
TIME TO GENERATE H/ADP REPORTS	3.20	3.50	3.13	3.50	3.00	4.00	4.00	3.00
ACCESS TO PATIENT LOCATION	3.54	3.69	3.57	3.50	4.00	4.00	2.50	3.50
TIME TO CHECK H/ADP REPORTS	3.10	3.63	3.00	3.50	3.00	4.00	4.00	4.00
EASE OF GENERATING CLINICAL RECORD COVER SHEET	3.60	3.57	3.25	3.00	3.83	3.80	-	-
AVAILABILITY OF DATA - WORKLOAD REPORTS	3.25	3.50	2.67	3.00	3.55	3.50	4.00	4.00
AVAILABILITY OF DATA - ULA QUARTERLY REPORTS	3.20	3.25	3.00	3.00	3.00	3.00	4.00	4.00
TIME SPENT ON DISPOSITION FUNCTION	2.62	3.50	2.63	3.57	1.67	3.00	4.00	3.50
AVAILABILITY OF DATA - PATIENT DISPOSITION	3.07	3.18	3.25	3.58	3.60	3.00	4.00	2.00
ELIMINATION OF REDUNDANT REGISTRATIONS	3.25	2.55	2.40	2.00	3.80	3.50	4.00	2.00
ACCURACY - HOSPITAL CENSUS/WHO AVAILABILITY	3.64	2.50	4.00	2.38	3.00	2.00	4.00	4.00
ACCURACY OF DATA - CHARGES AND BILLING	4.00	3.50	4.00	4.00	4.00	2.00	4.00	4.00
AVAILABILITY OF DATA - CHARGES AND BILLING	3.67	3.75	3.00	4.00	4.00	3.00	4.00	4.00
NUMBER OF OFF INQUIRY ACCOUNTS	3.50	3.67	2.00	-	4.00	3.00	4.00	4.00

TABLE 2

PERCENTAGE FREQUENCY OF OCCURRENCES BY WORK CENTER

	PRESENT FREQUENCY			COMPARISON TO FREQUENCY BEFORE TRIAD		
	OVERALL	K/ADT	CLINICAL RECORDS	OVERALL	K/ADT	CLINICAL RECORDS
ERRORS IN PATIENT REGISTRATION DATA	2.34	2.75	1.67	1.00	1.00	1.00
MULTIPLE REGISTRATIONS FOR THE SAME PATIENT	1.94	2.25	1.67	1.00	1.50	.50
DIFFICULTY IN DETERMINING PATIENT'S WORK	1.00	1.00	.80	1.63	1.50	1.75
ERRORS IN REPORTED PATIENT LOCATION	1.75	2.17	1.20	1.57	1.00	2.00
CODING ERRORS IN PREPARATION OF CLINICAL RECORD COVER SHEET	2.00	2.00	2.00	1.57	2.00	1.25
DELAYS IN CLINICAL RECORD COVER SHEET DUE TO INCOMPLETE/ LATE RETURN OF MEDICAL RECORD	2.90	2.67	3.17	2.43	2.00	2.75
ERRORS IN THE CODING TRANSCRIPT (AF 1366, AF 1367)	1.75	2.00	1.67	1.57	2.00	1.25

TABLE 4

PERCEIVED COMPARISON OF AUTOMATED TO MANUAL PROCEDURES BY WORK CENTER				
	OVERALL	W/ADP	CLERICAL RECORDS	BUSINESS OFFICE
THE AUTOMATED SYSTEM MAKES MY JOB EASIER	5.00	5.00	5.00	5.00
THE AUTOMATED SYSTEM MAKES MY WORK MORE EFFICIENT	4.64	4.55	5.00	5.00
THE AUTOMATED SYSTEM MAKES MY WORK MORE CHALLENGING	4.60	4.67	4.50	-
THE AUTOMATED SYSTEM REDUCES THE NUMBER OF PEOPLE NEEDED TO HANDLE THE WORK	3.91	3.67	4.50	3.00
THE AUTOMATED SYSTEM REDUCES THE NUMBER OF ERRORS	4.82	4.67	5.00	5.00

STAFF SATISFACTION QUESTIONNAIRE TABULATION

TABLE 5

	PERCEIVED EASE OF USE BY SUBS CENTER			
	OVERALL	W/ADJ	LEGAL RECORDS	PROSECUTOR OFFICE
IT DID NOT TAKE A LOT OF TIME TO LEARN TO USE THE SYSTEM	4.31	4.25	4.83	3.00
THE SYSTEM IS EASY TO USE	4.83	4.88	4.83	3.00

SUMMARY OF TIMED OBSERVATIONS

Date	Admission Waiting				Disposition			
	Time (min)	No.	R/A Time (min)	No.	Clear A&D (min)	No.	Total (min)	No.
9/27/83	4.76	15	9.32	17			5.14	2
9/28/83	16.98	10	6.50	10	1.11	13	5.20	7
9/29/83	13.27	9	6.94	9	3.20	5	5.79	5

APPENDIX D
DETAILS OF BENEFIT CALCULATIONS

A. Personnel Productivity

1. Time per unit of workload

a. Time to register and admit patients

Data available - baseline:

- o personnel hours worked during survey period - 1014
- o inpatient admissions - 1146
- o quarters and admissions - 187

<u>Task</u>	<u>% Time</u>	<u>Avg. Time Per Admission</u>
Complete AF560 and assign register no.	9.1	4.2
Determine bed availability	1.0	0.5
Update Bed Status Worksheet	1.6	0.7
Prepare MTRC	6.1	2.8
Imprint forms, etc.	3.5	1.6
Assemble patient chart	0.5	0.2
TOTAL		10.0

Example calculation:

$$\text{Avg. time} = \frac{\% \text{ time} \times 1014 \text{ hr}}{100 \times (\text{inpatient} + \text{quarters}) \text{ admissions}}$$

Data available - post-implementation

- o 51 inpatient admissions
- o 2 quarters admissions
- o observation interval 5 min.

<u>Task</u>	<u>No. Observations</u>	Avg. Time
		<u>Per Admission</u>
Complete AF560	32	3.0
Enter Registration Data	10	0.9
Enter Admission Data	32	3.0
Determine Bed Availability	11	1.0
Update Bed Status Worksheet	10	0.9
Prepare MTRC	3	0.3
Imprint forms, etc.	3	0.3
Assemble Chart	37	3.5
TOTAL		12.9

Sample calculation:

$$\text{Avg. time} = \frac{\text{no. observations} \times 5 \text{ min/observation}}{53 \text{ admissions}}$$

- b. Time to code Clinical Record Cover Sheet data available:
Clinical Record Office supervisor stated that two out of five full-time employees are no longer needed since TRIPAD was installed.

c. Reconcile Accounts Receivable

Data available - baseline:

Personnel time: totalling transactions $38.1 \frac{\text{min}}{\text{day}}$

Cash reconciliation $33.8 \frac{\text{min}}{\text{day}}$

Total $71.9 \frac{\text{min}}{\text{day}}$

Data available - post-implementation:

19 observations - reconcile cash

2 days observations

observation interval - 5 min

$$\frac{19 \text{ observations} \times 5 \text{ minutes/observations}}{2 \text{ days}} = 47.5 \frac{\text{min}}{\text{day}}$$

2. Time for individual admission and disposition functions:

a. Time to enter patient registration data.

Data available (see time per unit of workload).

Baseline time 4.15 min/admission.

Post-period 6.98 min/admission.

$$\text{Net reduction } 4.15 - 6.98 = -2.83 \frac{\text{min}}{\text{admission}}$$

$$\% \text{ reduction } \frac{-2.83}{4.15} = -68\%$$

- b. Eliminate manual retrieval of previous registration data.

Data: Interview with R/ADT supervisor stating that previous registration records were not saved or used for subsequent registration.

- c. Redundant capture of patient registration data:

Data:

Baseline: average time to set up form AF1127 in

Business Office $0.78 \frac{\text{min}}{\text{account}}$

Post-period: Business Office supervisor stated that AF1127's for inpatients are fully automated.

Net savings 0.78 min/admission.

- d. Time to produce MTRC.

Data:

Baseline time: 3.24 min/admission

Post-period time: 0.29 min/admission

Net reduction: $3.24 - 0.29 = 2.95$ min/admission

% reduction: $\frac{2.95}{3.24} = 91\%$

3. Time savings resulting from information availability
(see discussion in text)

4. Time to produce Patient Strength Report.

Data: R/ADT supervisor statement that the Patient Strength Report required about one man-hour per day to produce manually and is now fully automated.

5. Time to maintain Patient Information file.

Data:

Baseline: 4.2% of time devoted to maintaining 3x5 card file
1014 hrs worked
1146 inpatient admissions
187 quarters admission

$$\text{Avg. time} = \frac{0.042 \times 1014 \text{ hr}}{(1146 + 187) \text{ admissions}} = 1.92 \frac{\text{min}}{\text{admission}}$$

Post-period:

12 observations - disperse and file cards
5 minute observation interval
51 inpatient admissions
2 quarters admissions

$$\text{Avg. time} = \frac{12 \text{ observations} \times 5 \text{ min/observations}}{(51 + 2) \text{ admissions}} = 1.12 \text{ min/admission}$$

Net savings:

$$1.92 - 1.13 = 0.79 \frac{\text{min}}{\text{admission}}$$

$$\% \text{ savings} = \frac{0.79}{1.92} = 41\%$$

6. Eliminate individual Ward Bed Occupancy Lists

Data: Nursing supervisor stated that the practice of producing bed occupancy lists on each ward is unaffected by the TRIPAD system.

7. Nursing staff time devoted to clerical activities:

Data: Nursing supervisor stated that the TRIPAD system has had no effect on clerical activities performed by nurses on the wards.

B. Time to Train New Personnel (See discussion in text)

C. Patient Time (Length of stay due to administrative requirements)

1. Waiting time

Data:

Baseline: Time for wait plus admission process

$$17.64 \frac{\text{min}}{\text{admission}}$$

Time for admission process

$$10.11 \frac{\text{min}}{\text{admission}}$$

$$\text{Waiting time } 17.64 - 10.11 = 7.53 \frac{\text{min}}{\text{admission}}$$

Post-period: Average of timed observations 11.67 min/
admission

Net reduction in waiting time:

$$7.53 - 11.67 = -4.14 \text{ min/admission}$$

$$\% \text{ reduction} = \frac{-4.14}{7.53} = -55\%$$

2. Registration/admission process

Data:

Baseline: Average of timed observations from
Fairchild AFB:

$$10.11 \frac{\text{min}}{\text{admission}}$$

Post-period: Average of timed observations at
Keesler:

$$7.59 \frac{\text{min}}{\text{admission}}$$

Net reduction:

$$10.11 - 7.59 = 2.52 \frac{\text{min}}{\text{admission}}$$

$$\% \text{ reduction } \frac{2.52}{10.11} = 25\%$$

3. Business Office Inprocessing

Data:

Baseline: 16.95 sec/account for inpatient admissions
(timed observation, Keesler)

Post-period: Business Office supervisor stated that
incoming patients no longer stop at Business Office

$$\text{Net reduction: } 0.28 \frac{\text{min}}{\text{admission}}$$

4. Disposition

Data:

Baseline: Average of timed observations at Fairchild

$$\text{AFB } 3.60 \frac{\text{min}}{\text{disposition}}$$

Post-period: Average of timed observations at

Keesler: 3.15 min/disposition

$$\text{Net reduction: } 3.60 - 3.15 = 0.45 \frac{\text{min}}{\text{disposition}}$$

$$\% \text{ reduction: } \frac{0.45}{3.60} = 13\%$$

5. Business Office outprocessing

Date:

Baseline:	time to pull AF1127	22.86 sec
	post charges	27.52 sec
	post payment	36.88 sec
	Log AF1127	16.39 sec
	Total	103.65 sec
	1.73	$\frac{\text{min}}{\text{discharge}}$

Post-period: 39 observations "Discharge Patients"
56 patients discharged
5 min observation interval

$$\frac{39 \text{ observations} \times 5 \text{ min/observation}}{56 \text{ discharges}} = 3.48 \frac{\text{min}}{\text{discharge}}$$

$$\text{Net reduction: } 1.73 - 3.48 = -1.75 \frac{\text{min}}{\text{discharge}}$$

$$\% \text{ reduction: } \frac{-1.75}{1.73} = -101\%$$

- D. Patient Service (see text)
- E. Financial Benefits (see text)
- F. Patient Satisfaction (see text)
- G. Staff Satisfaction (see text)